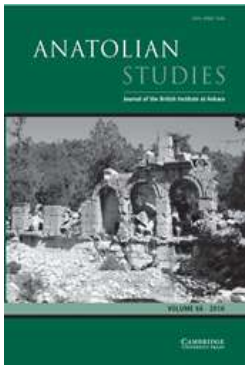

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A late antique ceramic workshop complex: evidence for workshop organisation at Sagalassos (southwest Turkey)

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Abstract

Sites of ceramic production have been discovered throughout the area that was once the Roman Empire; as a result, it is becoming increasingly clear that this industry was, in the Roman and late antique worlds, organised in numerous ways. In consideration of the organisational diversity in ceramic production attested during the period, this article presents some of the findings from the excavations of a late antique complex of ceramic workshops at the site of Sagalassos in order to consider archaeological evidence in terms of, not only the organisation of the manufacturing process, but also structures of workshop decision-making. Several lines of archaeological evidence are outlined, and argue for a model of independent work units integrated into a larger organisational structure of decision-making, and possibly even ownership, across the complex. In addition, the motivation to invest in a multi-workshop complex during the late antique period at Sagalassos is contextualised within the wider history of local and regional economic development.

Özet

Bir zamanlar Roma İmparatorluğu olan bölge genelinde seramik üretim yerleşimleri tespit edilmiştir ve sonuç olarak, Roma ve geç antik dünyada bu endüstrinin çeşitli şekillerde düzenlendiği giderek daha açık hale gelmektedir. Bu dönemler için tespit edilen seramik üretimindeki çeşitlilik dikkate alınarak, bu makalede Sagalassos yerleşiminde bulunan geç antik döneme ait seramik atölyesi kompleksinde yapılan kazılarda ele geçen bazı buluntular sunulmaktadır. Bu arkeolojik kanıtlar, sadece üretim sürecinin düzenlenmesi açısından değil aynı zamanda atölye karar verme mekanizmaları bakımından da ele alınmaktadır. Pek çok arkeolojik kanıt özetlenmiş ve kompleks genelinde bağımsız iş birimlerinin daha geniş bir karar verme örgütsel yapısına dahil olması ve hatta belki mülkiyeti de kapsayan bir model öne sürülmüştür. Buna ek olarak, Sagalassos'da geç antik dönemde birden çok atölye bulunan bir komplekse yatırım yapma eğilimi, yerel ve bölgesel ekonomik gelişimin daha geniş tarihi içinde ele alınmıştır.

Sites of ceramic production have been discovered throughout the area that was once the Roman Empire; as a result, it is becoming increasingly clear that this industry was, in the Roman and late antique worlds, organised in numerous ways. Production-organisation models (van der Leeuw 1977; Peacock 1982; Costin 1991) have provided a means of grappling with some of the diversity of production sites observed archaeologically. Often inspired by ethnographic observation of modern traditional craftspeople, these models have introduced terminology such as 'household production', 'workshop' and 'manufactory' into common discourse on ancient manufacturing contexts. While the study of production organisation offers a means of conceptualising the structural features defining the relationship between workers, materials, time and space (Greene 2003: 39-41), such models have largely been restricted to archaeological data. Other bodies of material, however, also offer alternative perspectives on the organisation of crafts production. For instance, Roman juridical sources, such as the *Digest* and Gaius' *Institutiones*, attest to forms of organisation that reveal property and management structures – from small, privately-owned and privately-operated establishments to properties owned by an individual or *societas* yet operated by a family member, slave, freedman or lessee (*Digest* 17.2; Gaius *Institutiones* 3.154a/b). These textual

examples suggest that decisions concerning the operation and management of a workshop might in some circumstances involve multiple parties with different roles and agendas. Associating archaeological examples of workshops with any of these textually attested arrangements, however, has remained problematic, largely due to the fact that the types of stipulation outlined in these contracts do not typically demonstrate differences that are observable in the archaeological material record of ancient workshops (i.e. the built environment, technologies or personal tools).

In considering the organisational diversity in ceramic production during the period, this article presents some of the findings from the excavations of a late antique (late fourth- to mid sixth-century) complex of ceramic workshops at the site of Sagalassos (southwest Turkey) in order to assess archaeological evidence in terms of, not only the organisation of the manufacturing process, but also structures of workshop decision-making. Several lines of archaeological evidence are presented in the following discussion and these suggest a model of independent work units integrated into a larger organisational structure of decision-making, and possibly even ownership, across the complex. This type of organisational configuration has not yet been observed for other ceramic workshops excavated at Sagalassos, and offers new insights into the range of organisational diversity within a geographically concentrated industry. Moreover, this mode of tiered decision-making falls beyond simple characterisations of 'nucleated workshops' (Peacock 1982: 99–113) that might more readily be applied to the wider industry at Sagalassos, and perhaps, instead, finds closer parallels with apportioned decision-making scenarios of the sort described in lease-labour legal contracts of the period.

In the final discussion, the workshop is contextualised within the wider economic history of the city, and it is argued that this ceramic workshop complex represents a significant investment in a long-standing, local industry during the late antique period. More specifically, while the location, production techniques and technologies, and raw material extraction mostly appear to be in keeping with traditions established at least as early as the end of the first century BC, the choice of product repertoire represents contemporary trends found both locally and at other sites in the eastern Mediterranean.

The Sagalassos ceramic industry

Dramatically constructed atop a series of large terraces, the archaeological site of Sagalassos overlooks the city's former territory which stretched out along the fertile valley systems below. The location of this late Classical/early Hellenistic to mid Byzantine site, at an elevation of 1,450–1,600m above sea level in the western Taurus mountains of southwestern Asia Minor (fig. 1), is striking. However, tucked away below a slight natural ridge, out of sight from the monumental urban centre, another major segment of the city also flourished throughout antiquity. This area, the Eastern Suburbium (in earlier publications referred to as the 'Potters' Quarter'), was a vibrant section of extramural urban development. Organised around a natural central depression, the area was built on artificial terraces that extended up the lower slopes of the mountain range to the north. The Eastern Suburbium witnessed over a millennium of intensive activity, with the earliest occupational evidence dated to the later fifth/early third century BC. Water infrastructure, human burial, industrial and religious activities, and rubbish disposal are all archaeologically attested in this area. The most conspicuous activity in archaeological terms is, however, undoubtedly ceramic production – specifically the manufacture of a regionally distributed tableware, Sagalassos red slip ware (hereafter SRSW), which was moved to this location in early Roman imperial times. Overfired waster sherds, broken moulds, kiln-stacking supports, furnace fragments and kiln slag (i.e. the discarded remains of ceramic production) densely litter the surface. Moreover, geophysical prospection has identified over 80 magnetic anomalies in the Eastern Suburbium (Mušič et al. 2008), which are interpreted as kilns across this 3.5–4ha area. The investigations in this section of the ancient city over the past 15 years have produced important data on ancient industry and working lives during the Roman imperial and early Byzantine periods.

In general, pottery production studies that attempt not to document the presence of a production site only, but also the *chaîne opératoire* and the social and economic dimensions of craft production at a site and in a region, are still relatively infrequent for the Roman-period eastern Mediterranean, and especially for Asia Minor; Sagalassos is an exception in this regard. Important examples of workshop analyses from the region (although not exhaustive) include those of the hippodrome workshops at Gerasa, Jordan (Kehrberg, Ostrasz 1997; Kehrberg 2001; 2009) and of workshops at Pergamon, Turkey (Poblome et al. 2001), Jerusalem, Israel (Arubas, Goldfus 1995; 2005), Elaiussa-Sebaste, southeastern Turkey (Ricci 2007; Ferrazzoli, Ricci 2010a; 2010b), Delphi, Greece (Petrides 2010), and Sinop, northwestern Turkey (Tezgör, Özsalar 2010). This situation in the eastern Mediterranean contrasts with that in the western and central Mediterranean where ceramic workshop studies are more prevalent and longstanding. Although the following list is far from comprehensive, it highlights some important examples: la Graufesenque, France (Schaad 2007; Schaad, Vernhet 2007); Sallèles d'Aude, France (Laubenheimer

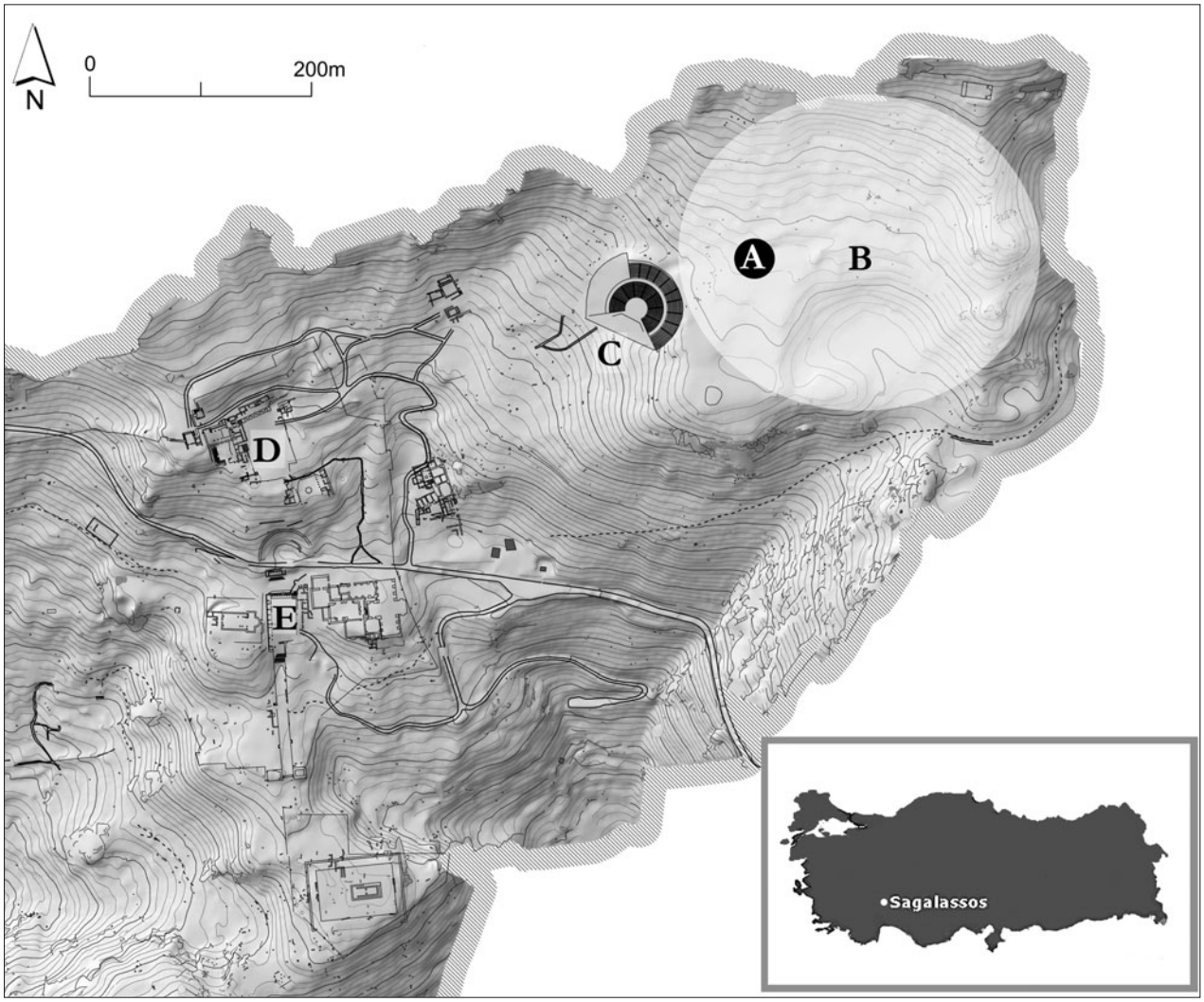

Fig. 1. Map of Sagalassos. (A) Location of workshop complex; (B) Eastern Suburbium; (C) theatre; (D) monumental city centre, upper agora; (E) monumental city centre, lower agora.

2001); Yvelines, France (Dufaÿ et al. 1997); Scoppieto, Italy (Bergamini 2007); Brindisi, Italy (Manacorda, Pallecchi 2012); and Leptiminus, Tunisia (Stone et al. 1998; Sterling et al. 2000; Sterling, Ben Lazreg 2001). In consideration of the current state of workshop studies in the Roman East, the research being undertaken on the red-slipped ceramic industry at Sagalassos is significant in developing these research themes in the region.

The workshop complex

Located on the northwestern side of the Eastern Suburbium of Sagalassos, approximately 90m to the east of the theatre, a large building was found to house the remains of the manufacturing of ceramic mould-made wares. Excavations in 2004, 2008–2009 and 2011 served to delineate the function of the spaces within this structure and determine that it was a complex of workshops. Subsequent analyses of hand tools, overfired sherd wasters, moulds and stamps helped to identify the product repertoire and techniques of production. Based on geophysical prospection and variation in surface topography, the complex is believed to have been approximately 750m² in area. Well over half of that area (475m²) has been excavated to date (fig. 2), and one of the individual workshops (the 'Southwest Workshop' or Workshop I; fig. 2) has been excavated in its entirety (fig. 3). Control excavations have also been undertaken at three other workshops to identify their product repertoire and occupational phasing. At least four workshops were originally incorporated into the building, and can be discerned as individual units based on the lack of access between them. The northern workshop (Workshop II; fig. 2) was constructed on a terrace, 1.20m higher than the floor level of the southern workshops, yet it appears to have still been a part of the complex, as its north–south walls continue into the southern units and its (southern) terrace wall was used as the northern wall of the adjacent workshop.

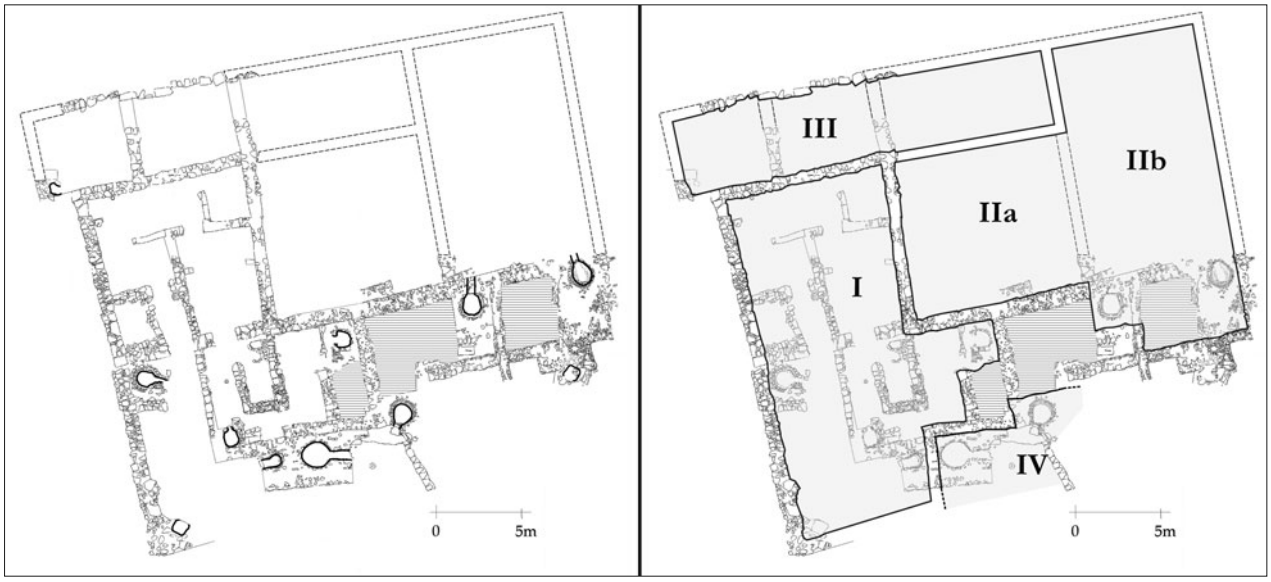

Fig. 2. Plans of the workshop complex during its sixth-century phase. North to top. Left: plan of workshop remains with kilns outlined in black; dotted lines indicate presumed extensions of walls in unexcavated sectors based on remote sensing; grey shaded areas indicate areas infilled during the sixth-century workshop phase. Right: proposed delineations of workshop units based on restricted access.

Architectural arrangements and phases of occupation: a common property?

Several unusual features of the building cause it to stand out from other workshops excavated thus far at Sagalassos. These observations are consistent with the reconstruction of the complex being a single property with some degree of centralised or shared decision-making. Such peculiarities concern its architectural design and phases of occupation.

First, the workshops were built together so tightly that abutting units appear to have shared structural walls. Mud-brick tends not to preserve well at Sagalassos, and most of what remains of these walls is the rubble limestone socle upon which mud-brick superstructures would have stood. There is a clear distinction between structural walls that divided the workshop units and internal workshop walls dividing interior spaces and rooms; structural walls range in width from 0.80m to 1.20m, while the internal separating walls are typically more narrow (ca 0.60m wide) and sometimes lack a stone socle. Once identified, it is clear that the structural walls are entirely shared between workshop units – with a single wall separating two abutting workshop units. This arrangement also suggests that the roofing structure may have been shared. The kilns of these workshops tend to cluster in what seems to have been a series of partially open-air courtyards. The courtyards were likewise delineated by a single line of dry-stacked rubble stones shared between the units. Thus, the workshops seem to have been provisioned with interior and exterior spaces. According to this architectural configuration of shared walls and roofing, the building perhaps should be conceived as a single property, and this assertion has been employed elsewhere for evidence of shared property, particularly concerning residential and commercial insulae (Ynnila 2012) and is based on a sixth-century treatise by Julian of Ascalon concerning property rights and building design rules (Saliou 1996: 39–50; Hakim 2001: 10–12). These rules outline regulations in the construction of adjacent buildings sharing structural walls and specifically advise that individual pottery workshops be separated by a distance of at least 30 cubits or 15.75m (Saliou 2012: 46–47).

In addition to structural walls and proximity, the occupational history of the complex suggests decision-making above the level of the individual work unit. Specifically, each individual unit appears to have undergone a similar series of activity sequences according to the same chronological phasing – from construction in the late fourth century to abandonment in the mid sixth century (see table 1). Although the workshop complex was constructed anew in the course of the late fourth century, the area on which it is situated hosted earlier features and structures, unrelated to ceramic production. These include late Hellenistic water-supply infrastructure and a large first/second-century building constructed entirely of limestone rubble walls with plastered faces and tuff stone, vaulted roofing. Several walls of earlier structures, particularly in the southern half of the complex, seem to have had their upper portions (the upper ca 0.40–0.70m) reused as support walls for ceramic kilns, and small spaces were filled in when the workshops were built. In general, however, when construction of the fourth-century ceramic complex commenced, the (northern) interior areas appear

to have been entirely cleared and levelled in preparation for the erection of the workshops. The interior, structural elements of the building were largely constructed *ex nihilo* on the site and the four units were integrated into the initial building plan already from its construction, as evidenced by the architectural phasing. Evidence for the earliest, fourth-century occupation of the complex is unfortunately rather limited, as the complex was used continuously for nearly two centuries with a single relevelling of floor surfaces identified. Only small amounts of fifth-century material were preserved in this relevelling fill, yet much of this material appears to be related to ceramic production (for example kiln furniture, occasional misfired ceramics), suggesting this occupational phase was involved in the production of SRSW tableware. The general parameters of the workshop complex seem to have been roughly the same as those of its final, sixth-century phase, a period for which there is significant evidence for specialisation in mould-made wares across the complex (see table 1). This suggests that the original scale was maintained throughout its period of activity. In the mid sixth century, ceramic production across the complex ceased. Dozens of objects associated with the production of ceramics were abandoned in the interior rooms and small courtyard spaces (Murphy, Poblome 2012: 209–10). Not long after, the floors of the standing kilns were removed and the furnaces adapted for use in lime burning (fig. 4a). The process of lime burning resulted in the partial destruction of the lower combustion chamber floorings of the kilns, which had originally comprised a horizontal surface of fired bricks and mud-plaster. Thin (ca 3–5cm) deposits of quicklime were preserved across the inner kiln floor surfaces. Reuse of the kilns for sixth-century lime burning does not appear to have necessitated extensive use/renovation of the associated interior workshop spaces.

While Workshop I (fig. 2) offered the most extensive evidence for ceramic production, three other areas were excavated in order to verify the chronological and functional sequence of the other workshop units. Excavation in each of the individual workshop areas demonstrated a consistent phasing sequence – late fourth-century construction, late fourth-century to early or mid sixth-century pottery activity, mid sixth-century conversion to lime burning and subsequent abandonment – across the complex. These excavation areas included a large section of the northern workshop (Workshop III); this was excavated to the depth of the sixth-century floor and associated abandonment fill. Unfortunately, due to safety concerns regarding a collapsing terrace wall to the north, deeper excavations could not be conducted in this area, but the excavations conducted do confirm the abandonment

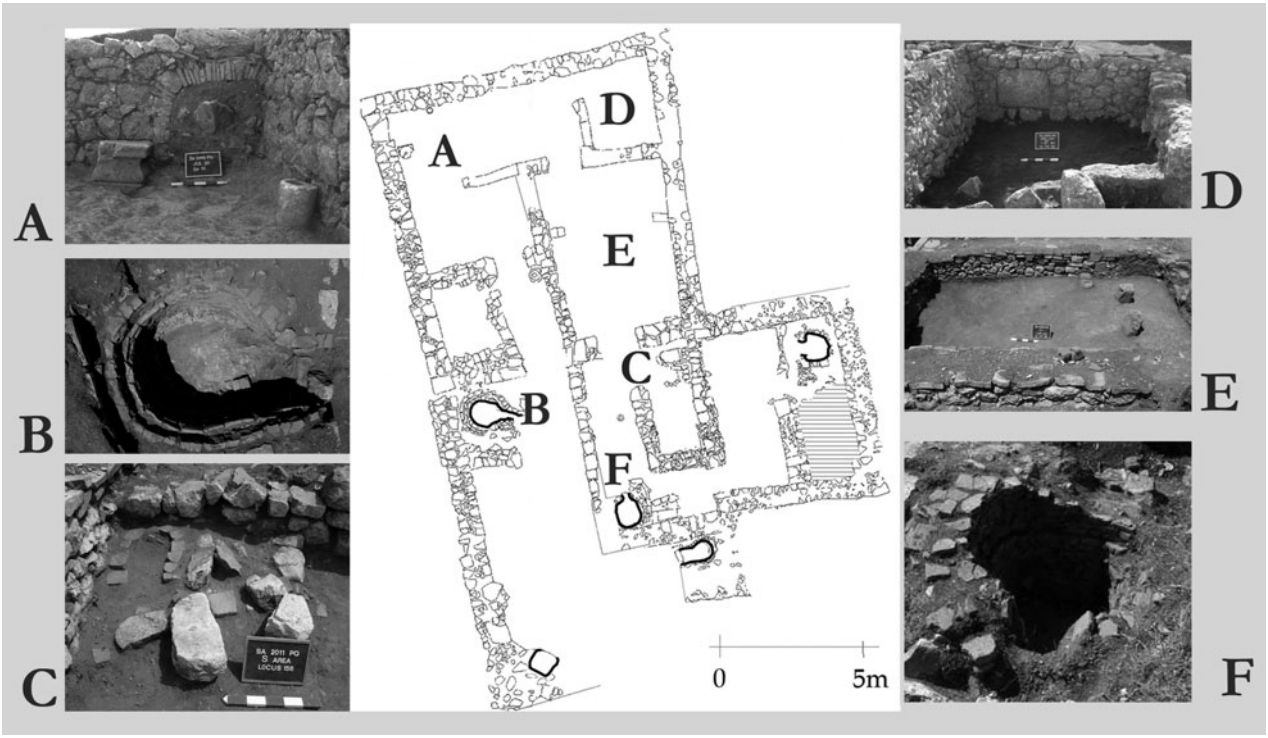

Fig. 3. Workshop I with functionally attributed areas. (A) Potter's-wheel workstation; (B) large kiln; (C) cooking oven and hearth; (D) vessel drying space; (E) main moulding workroom with clay preparation area along the northern wall; (F) small kiln. The locations of the four kilns definitely attributed to this workshop are indicated by black lines on the central plan; a possible fifth is indicated in the southwestern corner.

	Primary construction of workshop complex	*SRSW chronological evidence*	*Ceramic production evidence*	*Final ceramic abandonment*	*SRSW chronological evidence*	*Subsequent kiln conversion to lime burning*	*SRSW chronological evidence*
Workshop I (complete excavation)	Second half of 4th c. to early 5th c.	1A143, 1B101, 1B171, 1B221, 1C140	Stamps, moulds, finished products (oinophoroi, figurines)	Second to third quarter of 6th c.	1A140, 1B200, 1B210, 1B221, 1B230, 1B231, 1B232, 1C140, 1C180, 1F160, 1F180	Second to third quarter of 6th c.	1B130, 1B232, 1B233, 1F140
Workshop II (sondage)	Second half of 4th c. to first half of 5th c.	1A140, 1B100, 1B130, 1B190, 1B221, 1C101, 1C140, 1C160, 1C170, 1C180, 1F160	Stamp, stone polishing tool	Second to third quarter of 6th c.	1A140, 1B130, 1B180,1B221, 1B210, 1C140, 1F160	Second to third quarter of 6th c.	1B231, 1C140, 1F140, 1F160, oinophoros
Workshop III (partial excavation)	Unexcavated		Moulds (oinophoros, lamp), finished products (oinophoroi, figurine)	Second to third quarter of 6th c.	1A143, 1B180, 1B210, 1B220, 1B221, 1B232, 1F140, 1F160, 1F180	Second to third quarter of 6th c.	1B130, 1B170, 1B232, 1C180
Workshop IV (partial excavation)	Second to third quarter of 1st c., with some 4th-c. material (4th-c. walking surface cut down into 1st-c. structure)	1st c.: 1A100, 1A110, 1A130, 1A160, 1B150, 1B170, 1B190, 1C100, 1F150; 4th c.: 1B190, 1C110	Moulds (oinophoroi), finished products (figurine)	Second to third quarter of 6th c.	1A143, 1B130, 1B180, 1B200, 1B210, 1B230, 1B231, 1B232, 1C180, 1F180	Second to third quarter of 6th c. with minor 2nd-c. residuals	1B130, 1B140, 1B180, 1B200, 1B232, 1C180, 1F140, oinophoroi

Table 1. Chronological evidence for phasing of the individual workshop units.

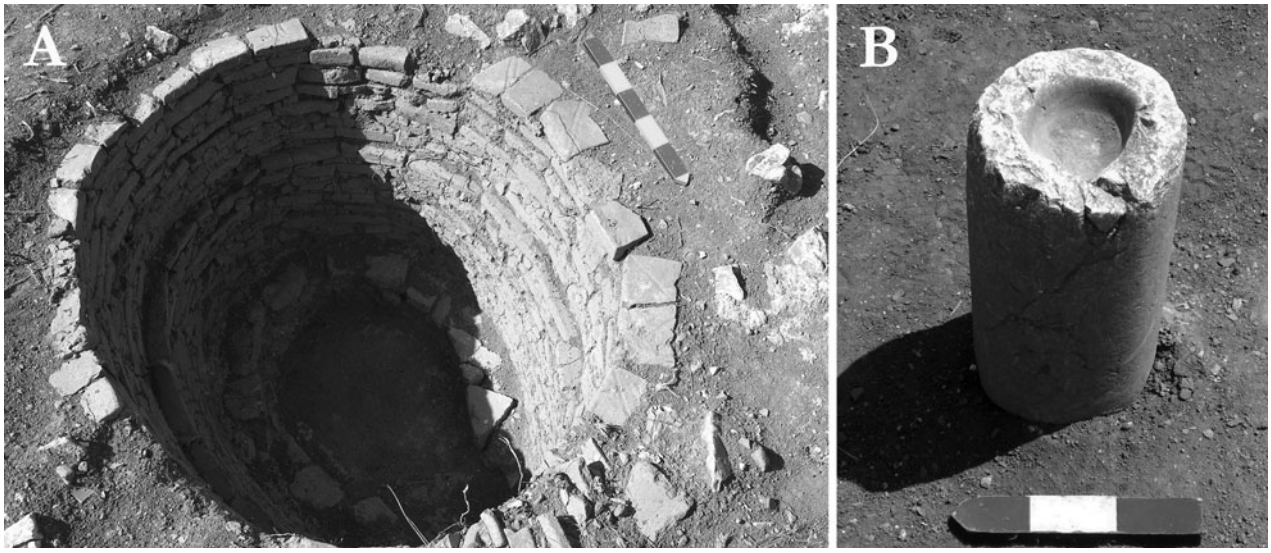

Fig. 4. Workshop technologies. (A) Kiln 1 from the workshop complex. The ridges along the side walls of the kiln demarcate where the dismantled combustion chamber floor and firing chamber floor were originally situated. The floors were removed during subsequent reuse of the kilns for lime burning. (B) Upstanding limestone shaft with depression on upper face, possible support for a potter's wheel.

date and provide evidence, retrieved from the floor surface, of the same types of mould-made wares (i.e. a complete oinophoros, a moulded warrior figurine) as those retrieved from Workshop I. A small sondage (2m by 1m) was excavated into the southwestern interior corner of Workshop IIa and across the wall from Workshop I. This excavation confirmed the two-phase occupational chronology in this workshop with an abandonment fill dating to the sixth century and an underlying late fourth-century to early fifth-century fill. This occupational sequence corresponds to that of the adjacent Workshop I. A ceramic stamp depicting a warrior with a spear found in the sixth-century abandonment deposit offers a match with finished oinophoroi found in the courtyard areas to the south, evidencing production that fits into the wider repertoire of moulded decorated wares from the complex. Dating of these deposits was primarily based on the stratigraphic association of diagnostic SRSW, as defined by the typology of Jeroen Poblome (1999). The SRSW typology is matched by a well-vetted and relatively refined ceramic chronology for the site of Sagalassos. The primary diagnostic SRSW types found in each of the deposits are listed in table 1 and examples of SRSW profiles are displayed in figure 5.

The consistent occupational phasing suggests that an initial investment was made that included all the workshops, and from its inception the building was intended to host individual units. Furthermore, changes to each workshops' function and their abandonment occurred uniformly across the complex. This seems to represent property decision-making above the level of a single workshop. Both the architectural design and phases of occupation of the complex support the assertion that this was a single property, while the architectural delineations between workshop units are also clear and suggest individual units. The shared occupational phasing of each individual unit, however, provides strong evidence that management (and possibly ownership) was centralised.

Workshop I: an independent production unit

Although portions of four workshops in the complex have been excavated, only one, the southwestern Workshop I, has been fully excavated. By reconstructing discrete functions within the workshop unit, excavation has established the independent nature of the workshop as a production unit. In fact, different spaces can be attributed to different stages in the ceramic production cycle (fig. 3), and provide clear evidence that the unit was fully capable of supporting the entire production process; consequently, its designation as an independent workshop is warranted.

In its sixth-century phase, the workshop was spread over five interior spaces and an exterior courtyard area. From the courtyard (which presumably opened onto a street to the south) the interior of the workshop was accessed through a main door, the stone lintel and stoop of which are still preserved in situ. Through the doorway, a narrow corridor led into the main workrooms of the unit. Function can be attributed to several of these work spaces based on abandonment contexts. These floor contexts have provided a relatively well-preserved corpus of material related to ceramic production. The southeastern space (space E; fig. 3) offered extensive evidence for ceramic

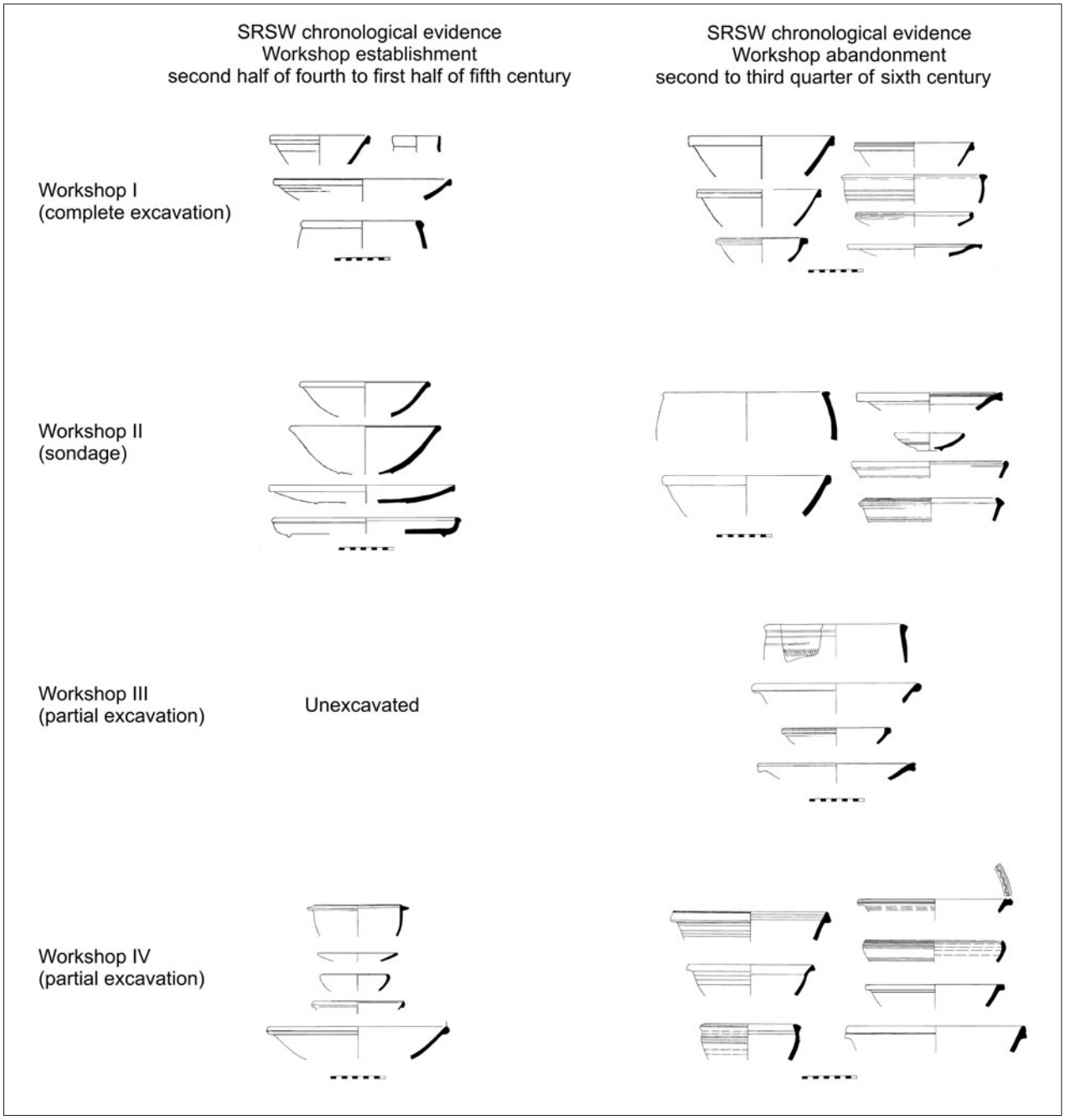

Fig. 5. SRSW evidence used to date the establishment and abandonment of each workshop unit.

production; along the northern wall of the room, a thick (ca 0.30m) deposit of cleaned, Sagalassos Fabric 1 clay was concentrated atop the floor. The southern edge of this clay pile was delineated by a series of large stones that may have supported a wooden divider separating the clay pile from the rest of the workroom to the south. Embedded in this layer of clay was a large coarseware container (Sagalassos Type 2F120: Degeest 2000: 138–39, figs 361–62) which was likely used to hold water; within the container a complete scraper fashioned from a cow rib was found, which was probably used to remove sections from the clay pile. The presence of these items suggests that the area was not only a storage space for the clay, but was a location where it would have been worked and prepared by foot wedging. The rest of the space is interpreted as a work area for moulding wares due to the high frequency of moulds and stamps present in the room. In the southern wall of the space, a door accessing the courtyard was found. The doorway may have allowed additional light to enter the workspaces where detailed work was being performed, an issue of particular importance for the south-eastern workspace (space E; fig. 3) as the eastern wall of that space is shared with another workshop and thus likely lacked windows to the outside.

What appears to be an individual workstation was found in one of the back rooms of the workshop (space A; fig. 3); in the northwestern corner of the workshop, a pottery-wheel support, a column base and a large wall niche were discovered. The floor surface around these features was lensed with two types of clay that have been archaeometrically identified – Sagalassos Fabric 1 used for the ceramic body and ophiolitic-flysch clay used for the ceramic slip (Ottenburgs et al. 1995; Laduron, Depuydt 1997; Degryse, Poblome 2008; Degryse et al. 2008). The total assemblage suggests the workstation of a potter at the wheel, seated on a spoliated column base. In fact, use of spolia, particularly from nearby (abandoned) tombs, is common within the complex, as well as for construction material in its walls. This combination of a wheel support with associated flat-topped stone situated approximately 0.30–0.50m away has been noted in at least three other instances in the coroplast complex. Fashioned from local limestone, the cylindrical stones maintain slight depressions on at least one end that were formed by lathe turning (fig. 4b). While they very much resemble the sorts of rolling stones used even today in the region to level roofs and ground surfaces, one of these cylinders was found positioned upright, with the underside broken across the shaft, and another was found with an imperfectly rounded outer surface that exhibited flattened faces; both these features make it unlikely that they were used as stone rollers. The occurrence of these types of stone has been identified in at least two other excavations of ceramic workshops from other parts of the city, further supporting their association with pottery making. In three of the cases in the complex under discussion they were found in an upright position (the fourth was a disturbed context associated with the installation of a later water channel, so its original position at the abandonment of the workshop is unclear). Moreover, their association with another nearby stone with a flat upper surface (possibly a seat?) further suggests that they may have served as supports for wheels. One example was found in proximity to a wall, so they may have been moveable to some extent. We currently have minimal evidence for the rotational components or wheel heads.

Such wheels in the complex likely produced the necks and rims of the oinophoroi manufactured here. As space A is the only area in the entire workshop offering evidence of ophiolitic-flysch clay, it is possible that this was also the area where the ceramic products were slipped.

Finally, the small space in the northeast of the building has been interpreted as a drying room (space D; fig. 3). Among the most important factors directing the production arrangements for mould-made wares is the need for adequate drying space, as the production process for oinophoroi, for example, requires at least three stages of drying (i.e. after moulding, after neck and handle attachment, and after slip application). Lacking windows and provisioned with a naturally desiccating floor of volcanic sand, this closed-off space would facilitate an even drying of the wares.

Like the interior spaces, the courtyard was partitioned off with a dry-stacked rubble wall. The southern section of the complex was disturbed by later agricultural activity; however, the main entrance into the workshop would likely have been provided from the south, as no eastern or western routes of access into the courtyard are discernible. The courtyard was provisioned with four to five kilns tucked into the corners of the courtyard space. Four are relatively well preserved; a possible fifth in the southwestern corner was almost entirely dismantled by post-abandonment activity. Such infrastructure diversity would have provided flexibility in the firing schedules (i.e. for smaller loads) and technical specialisation (i.e. for the firing of smaller objects more susceptible to overfiring). In the northeastern corner of the courtyard, positioned against the outer workshop wall and the courtyard wall, a set of two small ovens was also found (feature C; fig. 3). These generally rectangular ovens were positioned side-by-side and were constructed of tile, brick and reused ceramics (North Oven dimensions: length 0.51m, width 0.24m, preserved height 0.35m; South Oven dimensions: length 0.38m, width 0.38m, preserved height 0.24m). The ceramic materials and mud-plaster used to construct the ovens display a slightly fired appearance, but do not display the same level of heat exposure as the larger ceramics kilns. Similar ovens have been found in contemporary urban domestic contexts at Sagalassos and are interpreted as cooking hearths or ovens. The presence of such cooking features, without additional evidence for permanent domestic habitation, suggests that some meals may have been cooked at the workplace. This is further supported by the presence of two cooking vessels displaying use-wear and heat exposure within the interior workshop spaces.

The organisation of the production cycle within Workshop I demonstrates spatial segregation of manufacturing tasks. Certain spaces were reserved for particular occupations, such as the clay storage/preparation area or the pottery-wheel workstation. In general, the early stages of the production cycle (i.e. clay preparation and mould-forming) appear to have been conducted in the front room (space E; fig. 3), while later stages (i.e. neck and rim throwing and slip application) appear to have been performed in the western and northern areas of the unit (space A; fig. 3). The spatial segregation of these tasks may indicate that they were performed by multiple individuals specialised in particular segments of the production process. This is also supported by patterns of incised markings observed on some tools from the workshops.

These markings suggest that such implements may have been the personal possessions of individual artisans within the larger workshop context (Murphy, Poblome 2012: 206–07). Identification of the full *chaîne opératoire* within the workshop demonstrates that the workshop was capable of being a fully independent production unit within the larger complex of units.

Raw materials

Integration across the workshop complex is discernible in shared resources; this, however, is not unique to the complex, but rather is consistent with raw material provisioning for the entire SRSW industry.

Clay fabrics used in ceramic production have been geologically provenanced (Ottenburgs et al. 1995; Poblome 1995: 501–04; Laduron, Depuydt 1997; Degryse, Poblome 2008; Degryse et al. 2008). The extraction location for the SRSW clay is situated 8km to the south and at an altitude 300m below the production site. Each of the workshops of the complex was supplied with clay from this source for use in the body fabric of the vessels. The clay used for slipping the objects was likewise consistent across the complex – being ophiolite-flysch clay found more generally in the area of Sagalassos.

Product repertoire

Each of the workshops within the complex, at least by the sixth century, manufacturied a rather limited range of objects, and specialised in coroplast production of oinophoroi, head pots, lamps, figurines and stamp-decorated platters (fig. 6). Not only do the repertoires of the workshops show functional and morphological parallels, but they even show marked consistency in the decorations and iconography used on the products. When considered in relation to the wider production of SRSW at this time, these mould-made wares represent a rather small portion of the wider product range of the period. This suggests a relatively high degree of product specialisation, and one unusually concentrated among several workshops within a complex.

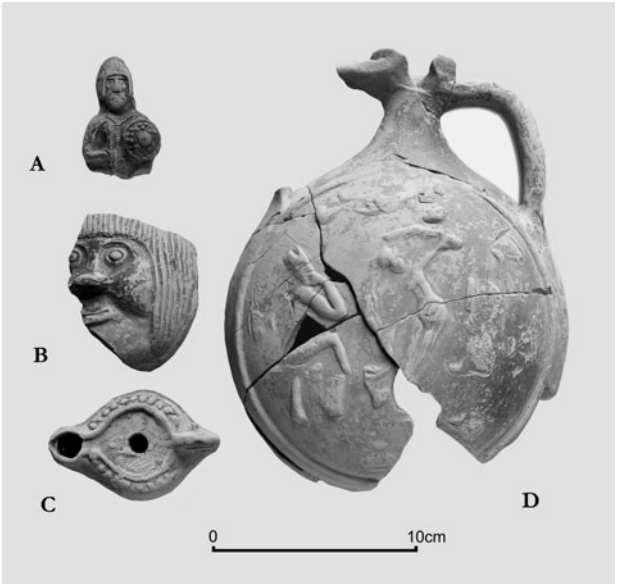

Fig. 6. Examples of product types from the workshop complex. (A) Warrior figurine; (B) head pot; (C) lamp; (D) oinophoros with Dionysiac imagery.

An explanation for the establishment of a group of workshops producing mould-made wares might be found by reference to the details of the product repertoire – which appear to fit into trends in material culture found at other sites in the eastern Mediterranean, as well as earlier traditions at Sagalassos. First, the oinophoroi include circular, square, cylindrical and hexagonal-sided types, with the circular-shaped being most common. These two-sided, vertically-seamed moulded vessels are decorated in relief with either geometric designs or figural scenes. Morphological parallels (albeit smaller in size) can most notably be found at the northern Egyptian sites in the Mareotis region related to the cult of Minas (Kiss 1989; Seif 2006). Second, a type of head pot was produced in the workshops. These vessels present a bearded male face (sometimes smiling) and are provisioned with a small hook on the outer rim edge, presumably for hanging. Moulds for these head pots were also used to produce oinophoroi (i.e. as one side of a vertically-seamed mould set). Multiple examples of these head-pot moulds and one *patrix* stamp of the type have been discovered in the course of the workshop excavations (fig. 7). Similar types are also known from Shop 2 at Bet Shean (Agady et al. 2002: 524), and another production centre for face pots of this type has been identified at Gerasa (Kehrberg 2009: 499, fig. 5). The body of evidence for figurine production is dominated by the warrior on horseback type. The warrior is consistently outfitted with a helmet, shield and spear/sword, and the horses are shown with trappings. Other figurine types include horses (without rider), dogs and other quadrupeds. Lamps are produced with two horizontally-seamed moulds and occur in two morphological types: elongated oval and circular forms. As an assemblage, the iconographic depictions on these objects fall into several themes – hunting/warrior scenes, Dionysiac symposia, vineyard harvests, Christian churches – and P. Talloen and Poblome have argued that such iconography is tied to both local and regional traditions in material culture (Poblome 1998; Talloen 2003; Talloen, Poblome 2005: 61–65; Talloen 2011). Decorated dishes (1B233: Poblome 1999: 96–98, 378–79, fig. 41) may also have been produced, based on the presence of a large disk-stamp, most probably used to impress a decorated central medallion on these large platters. The latter type of product also displays inspiration from contemporary silverware.

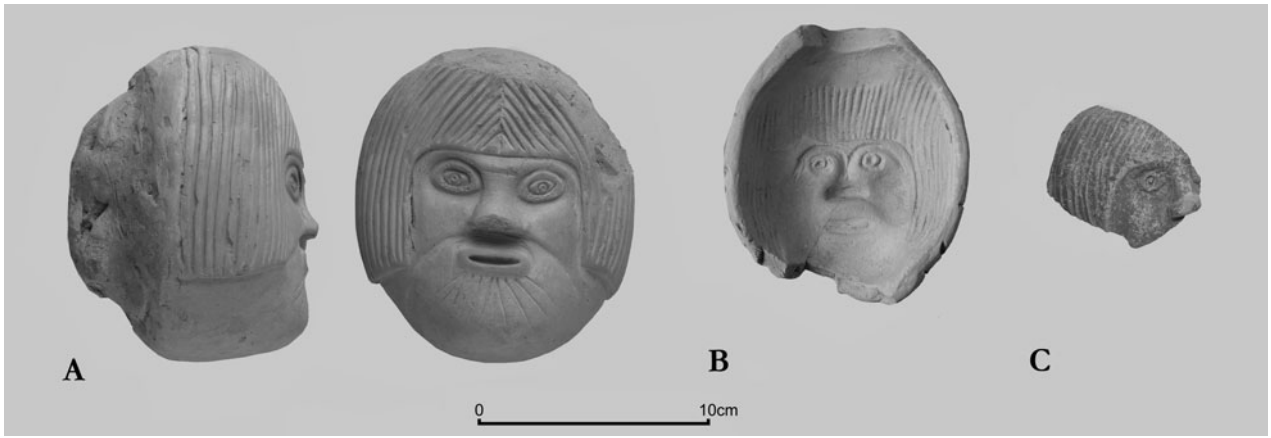

Fig. 7. Production sequence of head pots. (A) Patrix stamp (profile and frontal); (B) matrix mould; (C) fragment of finished pot.

The consistency in type, morphology and even iconography of the products being manufactured in the workshop complex is a striking feature of this production site. In terms of the wider SRSW industry, the product repertoire of the workshop complex represents only a modest portion of the full range of ceramic goods being manufactured at this time. The presence of such a tight concentration of workshops producing these objects suggests that the selection of wares may have been organised at a level above that of the workshop unit.

Organisation of the workshop complex and the Sagalassos ceramic industry

In his classic work, *Pottery in the Roman World: An Ethnoarchaeological Approach*, the late David Peacock (1982) outlined various ceramic 'modes of production' that provide ideal types of organisational structures defined by sets of variables (for example kinship structures, full- versus part-time labour and scales of production); these were derived from both ethnographic analogy and the archaeological record of the Roman period. Ranging in organisational complexity from domestic to factory manufacturing, this typology of production organisation includes a production 'mode' described as 'nucleated workshops' (1982: 9). According to this mode, independent workshops spatially clustered together in order to share access to resources and distribution networks. Although the features of 'nucleated workshops' might well characterise the industry at Sagalassos with its collective reliance on specific clay sources, the workshop complex described here does not neatly fit that model, as a more intimate relationship among the workshop units is implied by its structural and occupational history.

Each of the workshops in the complex displays elements of autonomy as a unit of production, yet also integration in terms of management. First, the architectural layout of the complex spatially defines individual workshops with no direct access between the production units. Furthermore, fully provisioned with infrastructure and materials, the workshops appear to have been capable of sustaining the entire production cycle of moulded wares. Thus, it is clear that the workshops were provisioned to be, and in fact operated as, independent production units. Second, although the production units were equipped to operate fully independently, other lines of evidence suggest that the organisation of the entire complex was integrated at a higher level. The general proximity of the workshops and the architecturally intertwined layout of the complex are conspicuous, as is the common mould-made product repertoire displaying similar iconography and decorative motifs manufactured in each of the workshops. Perhaps the strongest evidence for a more formal integration of the workshop organisation is detectable in the architectural phasing of the complex. The uniformity of functional transitions among each of the workshops suggests that the complex operated under a shared organisational structure (possibly implying ownership) yet also maintained some degree of spatial distinction between the individual production units.

As noted, this type of independent/shared decision-making has yet to be associated with other workshops excavated at Sagalassos and falls outside of Peacock's definition for 'nucleated workshop'. The complex instead perhaps more closely resembles the 'manufactory' mode of production described by Peacock in reference to first-century Arretine terra sigillata industries. Peacock's mode references a Marxist-inspired attribution by G. Pucci whereby multiple craftspeople work in a shared space owned by a single proprietor and each craftsperson individually manufactures the goods, sometimes with the help of assistants (Pucci 1973: 275–76; Peacock 1982: 121–22). The occurrence of multiple organisational types at the same production centre also presents questions concerning the suitability of such models in characterising local industry.

If we are to look for other organisational models for the period, we should consider the labour-lease arrangements that are known textually for ceramic production sites in other parts of the Roman Empire: namely, Egypt. Three papyrological examples of these *locatio conductio* (lease-hire contracts) are preserved from Oxyrhynchus. The papyri (P.Oxy. 3595–97) preserve *locatio conductio* dated to the middle of the third century AD (Cockle 1981) and are corroborated by sixth-century AD examples from Hermopolis (P.Lond. III 994, p.259) and Aphroditopolis (P.Cair.Masp. I 67110) (Cockle 1981: 90–97; Rowlandson 1998: 262–63). These describe workers hired according to various terms of contract, whereby the agreement is made by both parties *ex bona fide* (Cockle 1981). These contracts stipulate the terms set out by the owner of the property, who will supply part or all of a workshop building with its infrastructure (for example kilns, wells), as well as all clay and fuel raw materials. The leasing potter then independently operates the production space during a set period of time and takes on staff as he deems necessary. The use of workshop leases have been interpreted by archaeologists working in a wide range of pottery production contexts (Dannell 2002; Bergamini 2007: 66), yet there should remain understandable scepticism as regards archaeological applications of legal sources and the degree to which the agreements outlined from Egypt can be applied elsewhere in the Empire given an increasing recognition of local legal pluralism (Stolte 2001; Tuori 2007: 39).

Whether or not the *locatio conductio* system can be directly attributed to the workshop complex at Sagalassos is debatable, yet the correlation is important nonetheless. Not so much in terms of offering definitive attribution of the archaeological remains to known legal instances, but rather because the remains at Sagalassos suggest that economic decision-making may have been structured in such a way as to involve different groups of actors at different levels; some decisions within the workplace could be made, at least to some extent, independently within the workgroup, while other decisions were managed by different parties. This sort of distributed responsibility finds a parallel with the agreements outlined by *locatio conductio* contracts, offers some insight into the internal operations of such a workplace and hints at different fields of action accessible to different parties.

Sagalassos workshops and (sub)urban industry in the late antique period

As the construction of a complex of this scale, housing at least four workshops, represents a major investment by local parties, another important question is raised. Why was the production of these goods initiated at Sagalassos? The answer can be pursued by considering both the local historical development of Sagalassos' ceramic industry and contemporary trends in the material culture of the eastern Mediterranean.

As already highlighted, the workshop complex represents investment in a product repertoire that fits into product lines being marketed at Sagalassos and across the wider eastern Mediterranean at that time. For instance, the types of moulded wares being produced in the workshop complex are very much in keeping with products known from other moderately sized regional production centres located throughout the eastern Mediterranean. Thus, these were products that conformed to larger patterns in material culture throughout the region and that complemented the Sagalassos tablewares being manufactured contemporaneously. While these specialised moulded wares followed contemporary trends in the region, all the techniques and technologies of vessel formation and kiln firing were known and had already been employed throughout many centuries of ceramic production in the Eastern Suburbium of Sagalassos. For example, at least as early as the first century, figurines were being produced using both single- and two-part moulds, and vessels were formed on fast-turning potters' wheels. Kilns continued to be constructed in general accordance with a design known at Sagalassos since the Hellenistic period (Poblome et al. 2013: 193), using the same materials as had been employed since the second century. In general, the production techniques employed in the workshop complex do not differ substantially in either technical or technological terms from those of earlier periods.

Finally, it is important to contextualise the workshop complex in the wider economic history of the site. Previous work on the economic development of Sagalassos and its agricultural hinterland has identified a late antique (second- to fifth-century) period of moderate economic growth, based on reconstructions of population estimates and more specialised use of the production landscape (Poblome 2015). It was in this milieu that the investment in the workshop complex took place. Moreover, the construction of a complex producing mould-made wares added a level of specialisation to the traditional tableware production operating in the Eastern Suburbium of the city. Together with the contemporary initiation of a local line of amphora production in the hinterland (Poblome et al. 2008: 1006–09), the more specialised field of artisanal production fits into wider trends of economic development in the region, and it is not surprising that such investment would also be applied to industries – such as the red-slip ceramic industry of the Eastern Suburbium – that had proven to be largely successful for the previous five centuries and which already maintained long-established supply and distribution networks. Local resources of technological knowledge

and high-quality raw materials could thus easily be tapped at Sagalassos, and an integrated property management structure, possibly even under a *locatio conductio* system of leasing, presents an adequate means of managing workers and industrial properties – particularly in a context, such as Sagalassos, that maintained a substantial labour pool of potters experienced in working with the local raw materials and in the rather harsh climate zone in which Sagalassos is located. Thus, at a time when economic investment was being renewed across the region, areas that had long been profitable were selected for investment and pre-existing structures of property management were employed, while the choice of product line was based on contemporary trends in both local and regional consumption.

In conclusion, the long-standing position of the red-slip ceramic industry at Sagalassos and its organisational institutions appear to have played a critical role in the site's economic development well into the late antique period, and the workshop complex presents an important case study for the archaeological analysis of property and labour organisation within such local contexts. The persistence of the centuries-old industry using high-quality local clays appears to have presented the opportunity to integrate networks of artisans and workshops that could be employed and managed in diverse ways.

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References

Agady, S., Arazi, M., Arubus, B., Hadad, S., Khamis, E., Tsafrir, Y. 2002: 'Byzantine shops in the street of the monuments at Bet Shean (Scythopolis)' in L.V. Rutgers (ed.), *What Athens has to do with Jerusalem: Essays on Classical, Jewish, and Early Christian Art and Archaeology in Honor of Gideon Foerster.* Leuven, Peeters: 423–591

Arubas, B., Goldfus, H. 1995: 'The kilnworks of the Tenth Legion Fretensis' in J.H. Humphrey (ed.), *The Roman and Byzantine Near East: Some Recent Archaeological Research* (Journal of Roman Archaeology Supplement 14). Ann Arbor, Journal of Roman Archaeology: 95–107

— 2005: *Excavations on the Site of the Jerusalem International Convention Center (Binyanei Ha'uma): A Settlement of the Late First to Second Temple Period, the Tenth Legion's Kilnworks, and a Byzantine Monastic Complex* (Journal of Roman Archaeology Supplement 60). Portsmouth RI, Journal of Roman Archaeology

Bergamini, M. 2007: 'Stato della Ricerca e degli Studi' in M. Bergamini (ed.), *Scoppieto* I. *Il Territorio e I Materiali (Lucerne, Opus doliare, Metali).* Firenze, All'Insegno del Giglio: 57–70

Cockle, H. 1981: 'Pottery manufacture in Roman Egypt: a new papyrus' *Journal of Roman Studies* 71: 87–97. http://dx.doi.org/10.2307/299499

Costin, C. 1991: 'Specialization: issues in defining, documenting, and explaining the organization of production' *Journal of Archaeological Method and Theory* 3: 1–56

Dannel, G.B. 2002: 'Law and practice: further thoughts on the organization of the potteries at la Graufesenque' in M. Genin, A. Vernhet (eds), *Céramiques de la Graufesenque et autres productions d'époque romaine. Nouvelles recherches.* Montagnac, Éditions Monique Mergoil: 211–42

Degeest, R. 2000: *The Common Wares of Sagalassos* (Studies in Eastern Mediterranean Archaeology 3). Turnhout, Brepols

Degryse, P., Poblome, J. 2008: 'Clays for mass production of table and common wares, amphorae and architectural ceramics at Sagalassos' in P. Degryse, M. Waelkens (eds), *Sagalassos* VI. *Geo- and Bio-archaeology at Sagalassos and in its Territory.* Leuven, Leuven University Press: 231–54

Degryse, P., Poblome, J., Viaene, W., Kucha, W., Ottenburgs, R., Waelkens, M., Naud, J. 2008: 'Provenancing the slip of Sagalassos red slip ware' in P. Degryse, M. Waelkens (eds), *Sagalassos* VI. *Geo- and Bio-archaeology at Sagalassos and in its Territory.* Leuven, Leuven University Press: 255–59

Dufaÿ, B., Barat, Y., Raux, S. 1997: *Fabriquer de la Vaisselle à l'Époque Romaine. Archéologie d'un centre de production céramique en Gaule la Boissière-École (Yvelines – France).* Versailles, Service Archéologique des Yvelines

Ferrazzoli, A.F., Ricci, M. 2010a: 'Le produzioni di ceramiche comuni decorate di età protobizantina di Elaiussa Sebaste in Cilicia' in S. Menchelli, S. Santoro, M. Pasquinucci, G. Guiducci (eds), *LRCW* 3. *Late Roman Coarse Wares, Cooking Wares, and Amphorae in the Mediterranean. Archaeology and Archaeometry. Comparison between Western and Eastern Mediterranean.* Oxford, Archaeopress: 803–14

— 2010b: 'Un centro di produzione delle anfore LR1: Elaiussa Sebaste in Cilicia. Gli impianti, le anfore' in S. Menchelli, S. Santoro, M. Pasquinucci, G. Guiducci (eds), *LRCW* 3. *Late Roman Coarse Wares, Cooking Wares, and Amphorae in the Mediterranean. Archaeology and Archaeometry. Comparison between Western and Eastern Mediterranean.* Oxford, Archaeopress: 815–26

Greene, K. 2003: 'Roman pottery: models, proxies and economic interpretation' *Journal of Roman Archaeology* 18: 34–56. http://dx.doi.org/10.1017/S1047759400007200

Hakim, B.E. 2001: 'Julian of Ascalon's treatise of construction and design rules from sixth-century Palestine' *Journal of the Society of Architectural Historians* 60.1: 4–25. http://dx.doi.org/10.2307/991676

Kehrberg, I. 2001: 'Ceramic lamp production in the 4th and early 5th centuries AD at the hippodrome of Gerasa: an empirical study' in E. Villeneuve, P.M. Watson (eds), *La céramique byzantine et proto-islamique en Syrie-Jordanie: IVe–VIIIe Siècles apr. J.-C.: Actes du Colloque tenu à Amman les 3, 4 et 5 décembre 1994.* Beirut, Institut français d'archéologie du Proche-Orient: 231–39

— 2009: 'Byzantine ceramic production and organizational aspects of sixth century AD pottery workshops at the hippodrome of Jerash' *Studies in the History and Archaeology of Jordan* 10: 493–512

Kehrberg, I., Ostrasz, A. 1997: 'A history of occupational changes at the site of the hippodrome of Gerasa' *Studies in the History and Archaeology of Jordan* 6: 167–73

Kiss, Z. 1989: *Les Ampoules de Saint Ménas découvertes à Kôm el-Dikka: 1961–1981.* Warsaw, PWN Editions Scientifiques de Pologne

Laduron, D., Depuydt, F. 1997: 'Clay raw materials of Sagalassos red slip ware. A chronological evaluation' in M. Waelkens, J. Poblome (eds), *Sagalassos* IV. *Report on the Survey and Excavation Campaigns of 1994 and 1995* (Acta Achaeologica Lovaniensia Monographiae). Leuven, Leuven University Press: 507–18

Laubenheimer, F. 2001: 'L'atelier de Sallèles d'Aude et son evolution dans le temps' in F. Laubenheimer (ed.), *20 Ans de Recherches à Sallèles d'Aude.* Paris, Pu Franc-Comtoises: 11–24

Manacorda, D., Pallecchi, S. (eds) 2012: *Le Fornaci Romane di Giancola (Brindisi).* Bari, Edipuglia

Murphy, E.A., Poblome, J. 2012: 'Technical and social considerations of tools from Roman-period ceramic workshops at Sagalassos (southwest Turkey): not just tools of the trade?' *Journal of Mediterranean Archaeology* 25.2: 197–217. http://dx.doi.org/10.1558/jmea.v25i2.197

Mušič, B., De Laet, V., Martens, F., Similox-Tohon, D., Verstraeten, G., Poblome, J., Talloen, P., Uytterhoeven, I., Waelkens, M. 2008: 'Geophysics, satellite imagery, urban survey and archaeological excavations – complementary contributions to reconstruct an ancient urban landscape – the case of Sagalassos (SW-Turkey)'. http://arheologija.ff.uni-lj.si/music/MUSIC-DE%20LAET-MARTENS%20ET%20AL_1.pdf

Ottenburgs, R., Viaene, W., Degeest, R., Waelkens, M. 1995: 'Statistical analysis of clays and heterogeneous sherds from Sagalassos' in M. Waelkens, J. Poblome (eds), *Sagalassos* III. *Report on the Fourth Excavation Campaign of 1993*. Leuven, Leuven University Press: 255–70

Peacock, D.P.S. 1982: *Pottery in the Roman World: An Ethnoarchaeological Approach*. London, Longman Group

Pétridis, P. 2010: *La Céramique Protobyzantine de Delphes: une Production et son Contexte*. Athens, École française d'Athènes

Poblome, J. 1995: 'The ecology of Sagalassos (southwest Turkey) red slip ware' in M. Lodewijckx (ed.), *Archaeological and Historical Aspects of West-European Societies: Album Amicorum André van Doorselaer.* Leuven, Leuven University Press: 499–511

— 1998: 'Dionysiac oinophoroi from Sagalassos found in Egypt' in W. Clarysse, H. Willems (eds), *Egyptian Religion: The Last Thousand Years* (Orientalia Lovaniensia Analecta 75). Leuven, Peeters: 205–26

— 1999: *Sagalassos Red Slip Ware: Typology and Chronology* (Studies in Eastern Mediterranean Archaeology 2). Turnhout, Brepols

— 2015: 'The economy of the Roman world as a complex adaptive system. Testing the case in second to fifth century CE Sagalassos' in P. Erdkamp, K. Verboven (eds), *Structure and Performance in the Roman Economy. Models, Methods and Case Studies* (Latomus Revue et Collection d'Études Latines). Leuven, Peeters: 97–140

Poblome, J., Bounegru, O., Degryse, P., Viaene, W., Waelkens, M., Erdemgil, S. 2001: 'The sigillata manufactories of Pergamon and Sagalassos' *Journal of Roman Archaeology* 14: 143–65. http://dx.doi.org/10.1017/S1047759400019863

Poblome, J., Braekmans, D., Mušič, B., Van Der Enden, M., Neyt, B., De Graeve, B., Degryse, P. 2013: 'A pottery kiln underneath the odeon of ancient Sagalassos. The excavation results, the table wares and their archaeometrical analysis' in N. Fenn, C. Römer-Strehl (eds), *Networks in the Hellenistic World: According to the Pottery in the Eastern Mediterranean and Beyond* (British Archaeological Reports International Series 2539). Oxford, Archaeopress: 175–86

Poblome, J., Corremans, M., Bes, P., Romanus, K., Degryse, P. 2008: 'It is never too late … The Late Roman initiation of amphora production in the territory of Sagalassos' in I. Delemen, S. Çokay-Kepçe, A. Özdizbay, Ö Turak (eds), *Euergetes. Festschrift für Prof. Dr. Haluk Abbasoğlu zum 65. Geburtstag*. Antalya, Suna Research Institute on Mediterranean Civilizations: 1001–12

Pucci, G. 1973. 'La produzione della ceramica aretine. Note sull' industria nella prima etá imperiali' *Diaologhi di Archeologia* 7: 255–93

Ricci, M. 2007: 'Elaiussa Sebaste: context, production and commerce' in B. Böhlendorf-Arslan, A.O. Uysal, J. Witte-Orr (eds), *Çanak. Late and Medieval Pottery and Tiles in Mediterranean Archaeological Contexts.* Istanbul, Deutsches Archäologisches Institut: 169–80

Rowlandson, J. 1998: *Women and Society in Greek and Roman Egypt: A Sourcebook.* Cambridge, Cambridge University Press

Saliou, C. 1996: *Le Traité d'Urbanisme de Julian d'Ascalon: Droit et Architecture en Palestine au VI siècle.* Paris, de Boccard

— 2012: 'Artisants et espace urbain dans le monde romain: Droit et projets urbains (Ier siècle av. J.-C. – Vie siècle. ap. J.-C.)' in A. Esposito and G.M. Sanidas (eds.), *«Quartiers» Artisanaux en Grèce Ancienne: une Perspective Méditerranéenne*. Villeneuve d'Ascq, Presses Universitaires du Septentrion: 39–53

Schaad, D. (ed.) 2007: *La Graufesenque (Millau, Aveyron)* 1. *Condatomagos une Agglomeration de Confluent en Territoire Rutène IIe s. a.C. – IIIe s. p. C.* Santander-Cantabria, Editions de la Fédération Aquitania

Schaad, D., Vernhet, A. 2007: 'Les données archéologiques de La Graufesenque' in D. Schaad (ed.), *La Graufesenque (Millau, Aveyron)* 1. *Condatomagos une Agglomeration de Confluent en Territoire Rutène IIe s. a.C. – IIIe s. p. C.* Santander-Cantabria, Editions de la Fédération Aquitania: 61–218

Seif, M.E.-D. 2006: *Die reliefierten hellenistisch-römischen Pilgerflaschen: Untersuchungen zur Zweckbestimmung und Formgeschichte der ägyptischen Pilger- und Feldflaschen während des Hellenismus und der Kaiserzeit.* Cairo, Institut français d'archéologie Orientale

Sterling, L.M., Ben Lazreg, N. 2001: 'A Roman kiln complex (site 290): preliminary results of excavations, 1995–98' in L.M. Sterling, D.J. Mattingly, N. Ben Lazreg (eds), *Leptiminus (Lamta) Report No. 2. The East Baths, Cemeteries, Kilns, Venus Mosaic, Site Museum, and Other Studies* (Journal of Roman Archaeology Supplement 41). Portsmouth RI, Journal of Roman Archaeology

Sterling, L.M., Stone, D., Ben Lazreg, N. 2000: 'Roman kilns and rural settlement: interim report of the 1999 season of the Leptiminus Archaeological Project' *Echos du Monde Classique/Classical Views* 44.19: 179–224

Stolte, B. 2001: 'The impact of Roman law in Egypt and the Near East in the third century AD: the documentary evidence. Some considerations in the margin of the Euphrates Papyri (P Euphr)' in L. de Blois (ed.), *Administration, Prosopography and Appointment Policies in the Roman Empire: Proceedings of the First Workshop of the International Network Impact of Empire (Roman Empire, c 27 BC–AD 406).* Leiden, Brill: 167–79

Stone, D., Stirling, L.M., Ben Lazreg, N. 1998: 'Suburban land-use and ceramic production around Leptiminus (Tunisia): interim report' *Journal of Roman Archaeology* 11: 304–17. http://dx.doi.org/10.1017/S1047759400017359

Talloen, P. 2003: *Cult in Pisidia. Religious Practice in Southwestern Asia Minor from the Hellenistic until the Early Byzantine Period*. PhD thesis, University of Leuven

— 2011: 'From pagan to Christian: religious iconography in material culture from Sagalassos' in L. Lavan, M. Mulryan (eds), *The Archaeology of Late Antique 'Paganism'* (Late Antique Archaeology 7). Leiden, Brill: 575–607. http://dx.doi.org/10.1163/ej.9789004192379.i-643.150

Talloen, P., Poblome, J. 2005: 'What were they thinking of? Relief decorated pottery from Sagalassos. A cognitive approach' *Mélanges de l'Ecole française de Rome. Antiquité* 117.1: 55–81

Tezgör, D.K., Özsalar, A. 2010: 'The reconstruction of a Roman kiln in the archaeological museum of Sinop' *Ancient Civilizations from Scythia to Siberia* 16.1/2: 199–546. http://dx.doi.org/10.1163/157005711X560381

Tuori, K. 2007: 'Legal pluralism and the Roman Empire' in P.J. du Plessis, J. Cairns (eds), *Beyond Dogmatics. Law and Society in the Roman World.* Edinburgh, Edinburgh University Press: 39–52

van der Leeuw, S.E. 1977: 'Towards a study of the economics of pottery making' in B.L. Beek, R.W. Brant, W. Gruenman-van Watteringe (eds), *Ex Horreo.* Amsterdam, University of Amsterdam Press: 68–76

Ynnila, H. 2012: 'Understanding neighbourhood relations through shared structures: reappraising the value of insula-based studies'. Paper presented at the Roman Archaeology Conference, Frankfurt